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13. ABSTRACT (Maximum 200 words) The grant supported a symposium on Computational Fluid Dynamics held at Half Moon Bay, California, June 26-28, 2000. The symposium consisted of three days of technical sessions on: .Theory of High Speed Flows .Algorithm Development and Computational Techniques .Applications in Aeronautics and Beyond (i.e. Electromagnetics, Magnetohydrodynamics, etc.) The symposium assembled the leading researchers in these fields and several distinguished scholars were invited to present their work. The goal was to present the state of the art with emphasis placed on new directions and practical applications in industry. With no parallel sessions, there was sufficient time for discussion and interaction between the participants.			
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Prepared by Principal Investigator
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June 2001

Symposium on Computational Fluid Dynamics and High Speed Flows

The purpose of this project was to support a symposium on CFD. The symposium was held on June 26-28, 2000 at Half Moon Bay Lodge, in Half Moon Bay, California.

The symposium consisted of three days and of technical sessions on:

- i. Theory of High Speed Flows
- ii. Algorithm Development and Computational Techniques
- iii. Applications in Aeronautics and Beyond (i.e. Electromagnetics, Magnetohydrodynamics, etc.)

The symposium assembled the leading research workers in these fields. Several distinguished scholars were invited to present their work. The goal was to present the state of the art and the emphasis was placed on new directions and practical applications in industry. There was no parallel sessions and with enough time for discussions and interaction.

Professor D. Caughey of Cornell University was the Co-Chairman of the symposium. The proceedings will be available by the end of summer. It contains excellent papers presented during the symposium. It took some time to collect all the important papers from the speakers - most of them are famous and busy.

The actual list of the program is included with the speakers' names and the titles of their talks.

Monday, June 26

Magnetohydrodynamics and Electromagnetics

- 9:00 am R. Agarwal & P. Deb: *Numerical Simulation of MHD Effects on Hypersonic Flow of a Weakly Ionized Gas in an Inlet.*
- 9:30 am J. Shang, P.W. Canupp, & D.V. Gaitonde: *Progress in Computational Magnetoaerodynamics.*
- 10:00am V. Shankar: *Large-scale Parallel Simulations in Computational Electromagnetics and CFD.*

Parallel Computing

- 11:00am W.R. Briley, R. Pankajakashan, L.K. Taylor, & D.L. Whitfield: *Scalable Parallel Solution of Unsteady Viscous Incompressible Flows using Multiblock Structured Grids.*
- 11:30am D. Kwak & C. Kiris: *Parallel Unsteady Turbopump Flow Simulations for Reusable Launch Vehicles.*

High-order Methods

- 1:30 pm A. Lerat, C. Corre, & G. Hanss: *Efficient High-order Schemes in Non-uniform Meshes for Multidimensional Compressible Flows*
- 2:00 pm M. Napolitano, P. Cinella, P. De Palma, & G. Pascazio: *Future Directions for Computing Compressible Flows: Higher-order Centering vs. Multidimensional Upwinding*
- 2:30 pm M. Vinokur & H. Yee: *Extension of Efficient Low Dissipative High-Order Schemes for 3-D Curvilinear Moving Grids*

Numerical Analysis and Methods I

- 3:30 pm B. Gustaffson & J. Nilsson: *The Initial-Boundary Value Problem for the Stokes Equations on Staggered Grids*
- 4:00 pm A. Jameson: *L-U Gauss-Seidel Schemes Revisited*
- 4:30 pm J.L. Thomas, B. Diskin, J.C. South, Jr., & A. Brandt: *Towards Textbook Multigrid Efficiency for the Compressible Navier-Stokes Equations*

Tuesday, June 27

Numerical Analysis and Methods II

- 9:00 am T. Barth: *Discontinuous Galerkin Methods in Computational Fluid Dynamics and Beyond*
- 9:30 am M.M. Hafez: *Simulation of Compressible Flows using the Generalized Cauchy-Riemann Equations*
- 10:00am N. Satofuka & M. Ishikura: *Lattice Boltzmann Simulation for Incompressible Flows*

Space Applications

- 11:00am K. Fujii: *CFD Applications to Space Transportation Systems*
- 11:30am K. Oshima & Yuko Oshima: *A new Unified Modelling of Two-Phase Heat Transfer Devices: Heat Pipes, Thermosiphons, Loop Heat Pipes, Etc.*

Aerodynamic Flows

- 1:30 pm G. Candler: *Numerical Simulation of Compressible Turbulent Flows*
- 2:00 pm M.G. Hall: *On Aerodynamic Prediction by Solution of the Reynolds-Averaged Navier-Stokes Equations*
- 2:30 pm D.W. Zingg, S. De Rango, & A. Pueyo: *Advances in Algorithms for Computing Aerodynamic Flows*

Aerodynamic Flows & Design

- 3:30 pm J-J. Chattot: *Aerodynamic Optimization in Incompressible, Inviscid Flow*
- 4:00 pm S. Obayashi, Y. Takeguchi, & D. Sasaki: *Multipoint Optimal Design of Supersonic Wings using Evolutionary Algorithms*
- 4:30 pm X. Zhong: *Numerical Simulation of Hypersonic Boundary Layer Stability and Receptivity*

Wednesday, June 28**Education and Research**

- 9:00 am E.M. Murman & A.W. Rizzi: *Integration of CFD into Aerodynamics Education*
- 9:30 am C-M. Hung, G.S. Deiwert, & M. Inouye: *The MacCormack Method - A Historical Perspective*
- 10:00am S. Reznick: *AFOSR Overview and Opportunities*

Applications of CFD

- 11:30am W. Schmidt & Rieger: *Thirty Years of CFD in Industry - Past and Future*

Vortical Flows

- 1:30 pm D.A. Caughey: *Implicit Multigrid Computation of Unsteady Flows past Moving Bodies*
- 2:00 pm A.W. Rizzi, F. DeTry, & S. Gortz: *Aspects of the Simulation of Vortex Flows over Delta Wings*
- 2:30 pm J. Steinhoff, Y. Warren, M. Moulton, L. Wang, M.Xiao, & M. Fay: *Vorticity Confinement: A Method to Compute Complex Flows*

Grids and Complex Geometries

- 3:30 pm M-S. Liou & Y. Zheng: *Development of 3D Dragon Grid for Complex Geometries*
- 4:00 pm K. Nakahashi: *Overset Unstructured Grids for Moving Body Problems*
- 4:30 pm W.B. Sturek, Sr. & D.J. Haroldsen: *Application of Multi-Block, Patched Grid Topologies to Navier-Stokes Predictions of the Aerodynamics of Army Shells*
- 5:00 pm Closing Remarks

Principal Investigator: Dr. Mohamed Hafez
 Project Title: "Symposium on Computational Fluid Dynamics and High Speed Flows"
 Sponsor: AFOSR
 Subject: Budget Justification for Travel

\$7,000.00 travel requested (Foreign: \$2,950.00, Domestic: \$4,050.00). The detail breakdown of the travel amount is as follows:

1. Invited speaker Dr. K. Oshima's travel from Japan to Half Moon Bay, California. Travel includes airfare from Japan to San Francisco, California, lodging, car rental, and per diem for four days (Foreign travel: \$2,950.00).
2. Co-Chairman Dr. D. Caughey's travel from Cornell University to Half Moon Bay, California. Travel includes airfare from Cornell University to San Francisco, California, lodging, car rental, and per diem for four days (Domestic travel: \$2,150.00).
3. Chairman Dr. M. Hafez's travel from Davis to Half Moon Bay, California. Travel includes lodging, car rental, and per diem for four days (Domestic travel: \$950.00).
4. Administrative Assistant's travel from Davis to Half Moon Bay, California. Travel includes lodging, mileage, and per diem for four days (Domestic travel: \$950.00).

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